The Mining Journal

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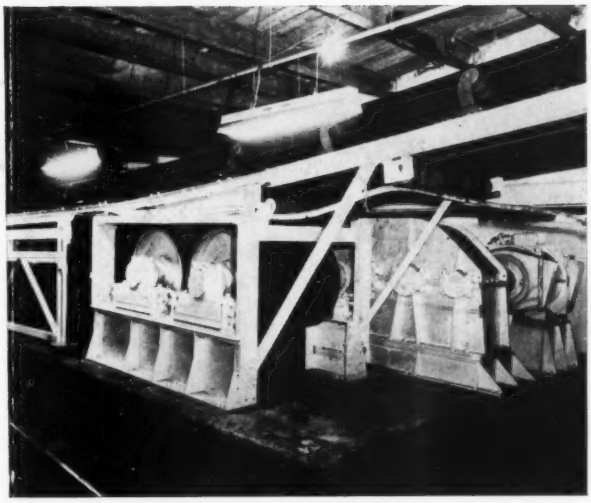
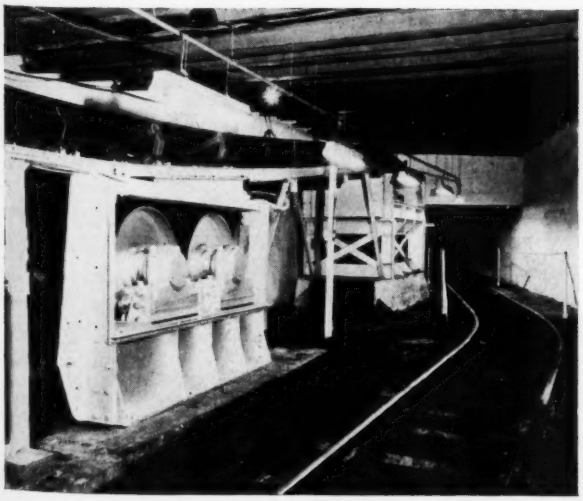


Experience of their first Huwood TB.200 conveyor quickly led to a demand for further Huwood conveyors in Australia. Two similar large Huwood conveyors one of two hundred and one of three hundred horse-power are now being sent to the same mining company — surely proof that the orthodox conveyor if properly made and installed can hold its own in any circumstances or working conditions, and has no rival in efficiency and economy.



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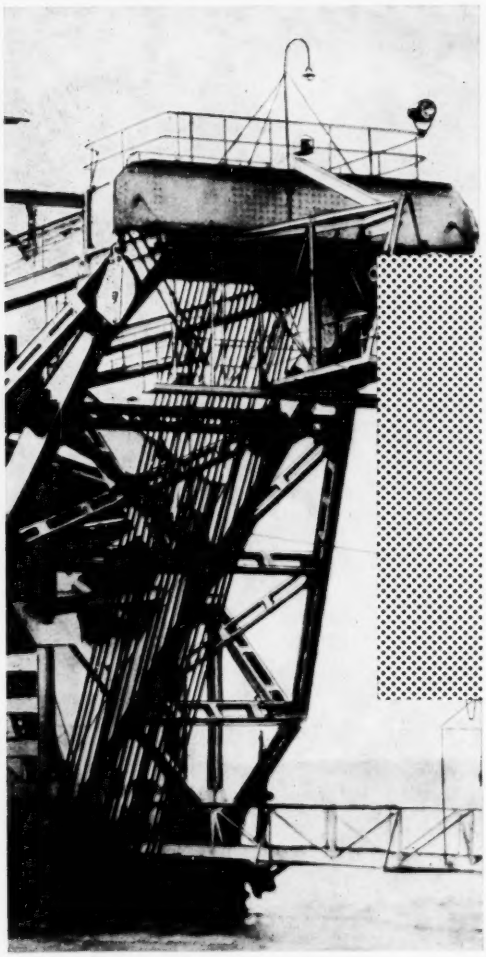

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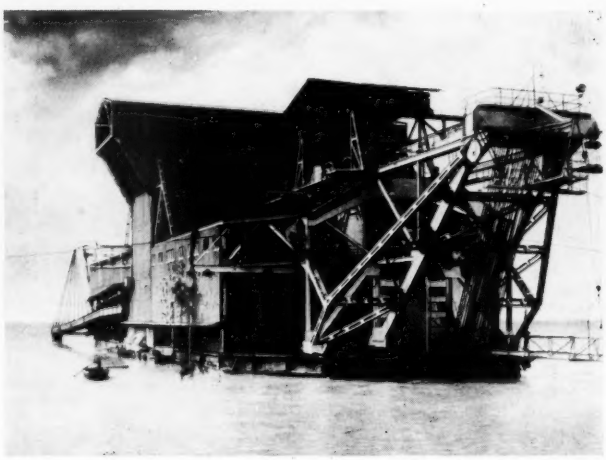

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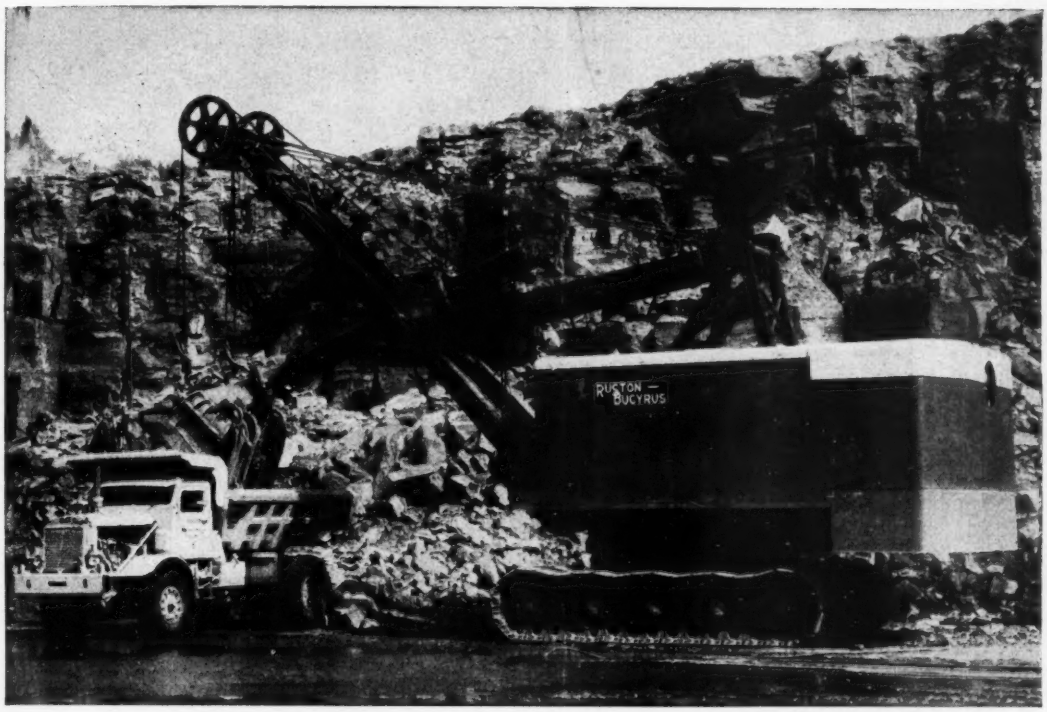

One of two Ruston-Bucyrus 110-RB electric shovels is shown excavating limestone for cement manufacture in Sweden. Three similar machines have been purchased by the customer for work in other limestone quarries —a tribute in itself to the dependability of RB machines. As will be seen, track links have to withstand constant abrasion and heavy loading under all conditions of service in water, mud, frost and dust.

Dependability in service comes from *quality* of engineering

FLAME HARDENING OF TRACK LINK LUGS, BEARINGS AND ROLLER PATH IS CARRIED OUT UNDER AUTOMATIC PROCESS CONTROL

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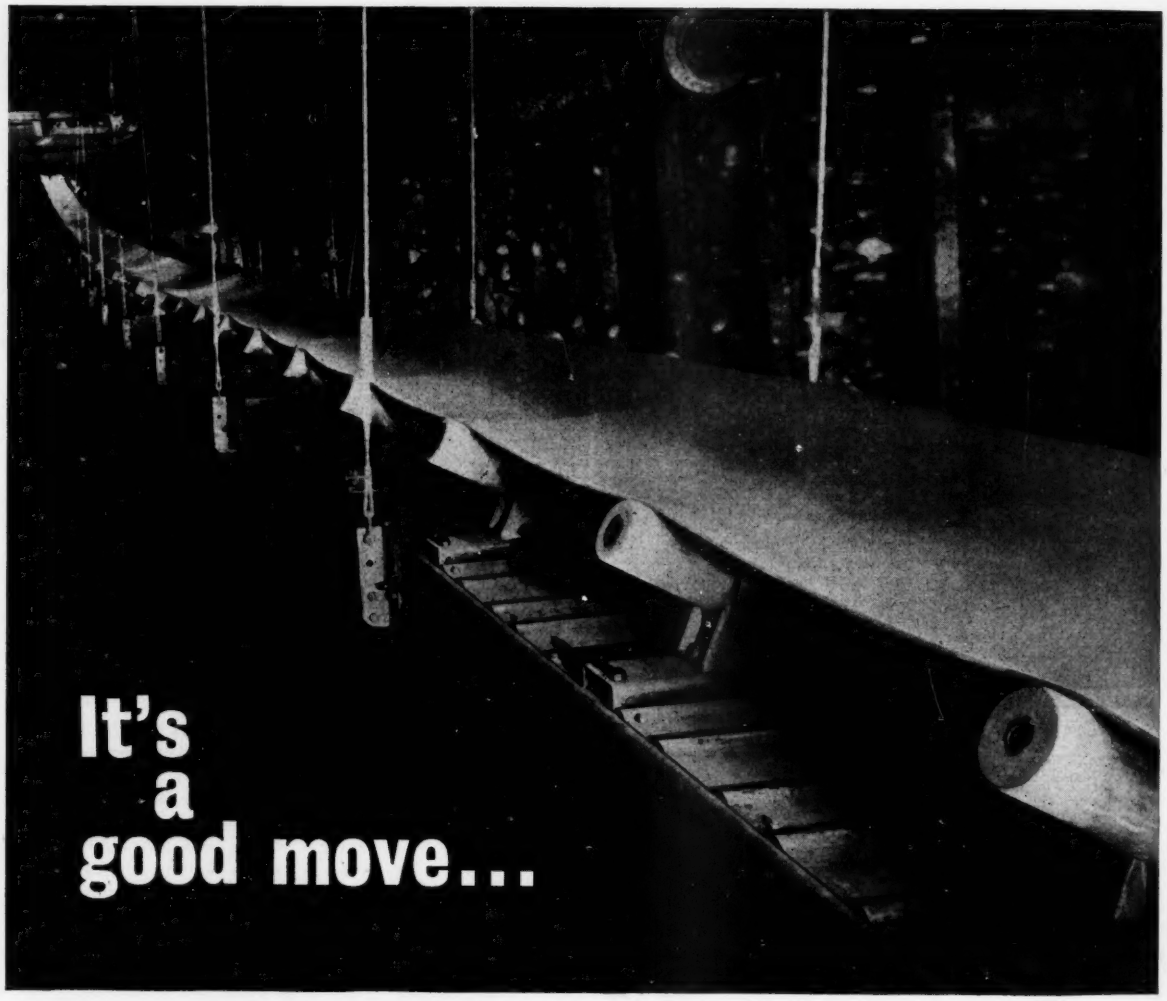

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Photograph by permission of the National Coal Board. Trunk conveyor, 1100 yards between centres, at Haig Colliery, Cumberland. 42 inches wide, 4 ply CN80 (nylon weft) belt by Barrow Hepburn & Gale, Mitcham.

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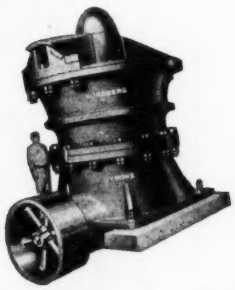

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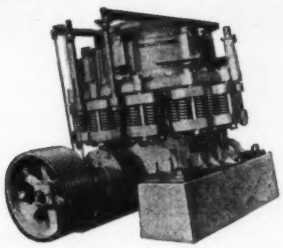

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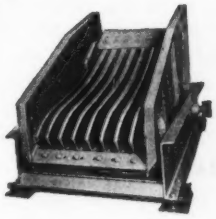

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The Mining Journal

London, September 30, 1960

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And Now Nigeria

TO the rapidly growing number of independent African nations will be added this week the largest and most populous of them all. Nigeria, which attains its independence on October 1, has a population estimated at between 35,000,000 and 40,000,000 comprising roughly one-sixth of the entire population of the African Continent.

The auspices under which this vast territory enters upon self-government are highly encouraging. The three Regions comprising the Federation have already become independent within their regional competence; save for the legal formalities national independence is virtually an accomplished fact. In marked contrast to the situation on the eve of Congo independence, a realistic approach to the process of " Africanization " has provided Nigeria with a sound framework of administration on which to build. Among the young Nigerian administrators, particularly at the top and middle levels, are many who would hold their own in any country. Moreover, despite the ethnological and sociological diversity of its peoples, and the existence of its three largely autonomous regions, Nigeria has emerged as a political entity with reasonable prospects of surviving as such. The Prime Minister, Alhaji Sir Abubakar Tafawa Balewa, is a staunch supporter of national unity, and in this respect his outlook appears to be shared by most educated Nigerians.

Nigeria gives promise, in fact, of becoming Africa's greatest and most truly democratic state; as such it could have a stabilizing and perhaps decisive influence on the continent's future. The Prime Minister is a strong supporter of the Western alliance, as are most of the other leaders. Politically, however, the Federal Government proposes to follow a policy of non-alignment with either of the power *blocs*, on the pattern of India.

Per head of population Nigeria is not so wealthy as Ghana. Her national income, which is rising at the rate of 10s. *per capita per annum*, was estimated at £800,000,000 in 1956-7. Exports have risen from £44,000,000 in 1947 to £136,000,000 last year. The mainstay of the economy is still agriculture, which accounts for 90 per cent of exports and employs 80 per cent of the working population. Nigeria is well endowed with natural resources, however, including a variety of minerals, and its population is large enough to support a broadly based economy on which a really prosperous country could be built. Both Germany and Japan are keenly aware of the possibilities for expansion and by granting extended terms, are buying themselves a valuable stake in the country's future.

Tin is, of course, Nigeria's main source of exportable mining wealth. Revenue from this source has been drastically curtailed as a result of the export restrictions imposed under the International Tin Agreement. In 1948 it amounted to only £4,000,000, having been as high as £8,500,000 in 1953. Columbite, too, which is found in association with tin, has also experienced a period of severe

depression, due to the cessation of U.S. stockpile purchases from non-domestic sources. After being as much as £5,000,000 in 1955, the value of Nigeria's columbite output fell to less than £1,000,000 a year.

The importance of mineral production to the Nigerian economy can be seen from the Mines Department annual report for 1957-58, the first nine month of which covers the period prior to tin restriction. Revenue from royalties, mining rents, etc., during that period amounted to £1,300,000, while expenditure within the country by the mining industry totalled nearly £5,000,000. In addition, the value of minerals exported—excluding oil— amounted to some £8,000,000. In view of the removal of the restrictions on tin exports, together with the revived demand for columbite, a substantial increase in the overall revenue from mineral products can be foreseen.

The Mines Department comes under the Federal Government, though it is the Regions whose exchequers will benefit the most from the operation of the mining industry. As is to be expected, the Federal Ministers are favourably disposed to an industry which, though accounting for a relatively small percentage of exports, is of key importance to present prosperity and future plans. Within the Department itself, Africanization has taken place extensively up to but not including the level of senior mine inspector, but this process has not been accelerated beyond the bounds of reasonable prudence. The Department still needs a number of Europeans and the terms must obviously be made sufficiently attractive to retain their services.

As in other emergent territories, the overseas investor must recognize that the upward trend in living costs will tend to be accelerated by independence, due to the understandable desire of the Federal and Regional Governments to step up living standards as rapidly as possible, which will be reflected by such measures as wage increases and higher import duties on imported machinery and stores. Further improvements in conditions of service were accorded to Nigerian labour in the tinfield towards the end of 1959 and there is, *inter alia*, a proposal for a national provident fund to take effect on October 1 this year. Such rising costs can only be met by improved methods of production and increased efficiency.

The Federal and Regional Governments all seem equally anxious to reduce the country's present dependence on agriculture by encouraging the development of other industries and resources. To this end they have adopted a policy of making loans to Nigerians to enable them to start new industries. Greater encouragement is also being given to the indigenous mine owner, who has so far played only a minor part in the exploitation of the country's mineral wealth.

To achieve her economic ambitions, however, Nigeria will have to rely heavily on foreign capital. The Federal and Regional Governments are accordingly seeking to encourage overseas investment, with the proviso that foreign interests establishing companies in the country are required to make provision for Nigerian participation, both financially and at board level. In this connection it is noteworthy that Nigerians are showing considerable interest in the purchase of stocks and shares of new companies.

A pamphlet recently issued on behalf of all three Regional Governments emphasizes that there are no plans for nationalizing industry beyond the extent to which public utilities are already nationalized and that adequate safeguards for the protection of investors will be provided in the event of any industry being nationalized in the future.

The importance attached to the processing of local ores and concentrates was indicated by the recent announcement that, in accordance with the expressed desire of the Nigerian Goverment, Consolidated Tin Smelters Ltd. had decided to install a tin smelting plant on the Jos Plateau and to form a company in Nigeria for that purpose. Portuguese interests are also proposing to set up a smelter.

Outside the tinfield, mining has so far been on a relatively small scale. Coal has been produced at Enugu since 1916. Output reached a peak of over 800,000 tons in 1957, but the industry has been severely hit by the decision of its principal customers, the Electricity and Railway Corporations, to switch to diesel power. Plans for an iron and steel industry in the Eastern Region, where large quantities of both iron and limestone exist, are under active consideration. Cement works based on local limestone have been established in both the Eastern and Western Regions. Other developments include the flotation of a company to explore and exploit deposits of barytes in Benue Province. Efforts are also being made to raise sufficient capital to permit the resumption of operations at the lead and zinc mines in Abakaliki Division.

The possible existence of valuable undiscovered mineral deposits in such an enormous territory as Nigeria can certainly not be excluded. Despite the activities of the mining companies much of the country is still largely unexplored, although the general geology is known. The Eastern and Western Regions in particular have been anxious to have surveys of their mineral resources carried out and have actively interested themselves in bringing this about. A team of economic experts from the Ford Foundation in America is now surveying Eastern Nigeria's resources and has expressed the opinion that this Region is rich in minerals. The Western Region has not yet been investigated to any great extent. A geological report published during the First World War suggested that minerals might exist. That nothing had been done to follow this up can be accounted for by such deterrents to prospecting activity as the absence of roads and railways and the presence of tetse fly.

It is in the development of its oil resources that Nigeria's most encouraging prospects lie. Oil is known to exist in large quantities in both the eastern and western deltas of the Niger. Some £60,000,000 have been spent on their development by Shell-B.P. and by the end of the present year exports are expected to reach the rate of 1,500,000 tons per annum. Production is at present limited by inadequate export facilities, but a crude oil terminal is being erected at Bonny and a channel being dredged through the Bonny River bar will allow 18,000 ton tankers to be loaded direct. Crude oil production could reach 10,000,000 tons a year by 1970. Nigeria would then be one of the two leading oil producing countries in the Commonwealth and among the first ten in the world.

LEAD IN NUCLEAR POWER STATIONS

The new nuclear power stations now being constructed in the United Kingdom have attracted considerable public interest through the medium of lay press publicity whilst the technical aspects have been fully exploited by numerous technical and scientific journals. Lead has possibly not been accorded a deserved measure of publicity though its contribution for shielding purposes is of vital importance.

Most people not having specialized knowledge of the subject of nuclear power will no doubt subscribe to the general theory that for reactor shielding concrete is to be preferred to lead, states an article in *Lead News*, No. 9, vol. 1, May, 1960. This may, to a large extent, be true when considering the reactor itself, but the contrary is the

case when dealing with the equipment necessary to start, maintain and shut down a station.

The machines used in refuelling and maintaining the reactor at Berkeley Power Station in Gloucestershire, which are being manufactured by the John Thompson Ordnance Co., all depend, at least in part, on lead for biological shielding. When the power station is operational, some 1,000 tons of lead will be incorporated to ensure the safety of the staff.

Apart from the various small incidental pieces of equipment, such as the skirts, fourteen machines will be installed. There will be two control rod and actuator servicing machines, each embodying between 70 and 75 tons of lead and four chute machines, each containing 65-70 tons of lead. Charge-discharge machines will each contain about 60 tons of lead, and finally the two sets of visual observation and removal equipment, will both contain between 55 and 60 tons of lead. The skirts mentioned earlier are approximately 11 ft. in dia. and in all involve about 95 tons of lead.

NEW METALS TECHNIQUES

Studies at the Warren Spring Laboratory of the Department of Scientific and Industrial Research, hold interesting possibilities for the recovery of certain common metals from ores which cannot be economically processed by conventional methods, using a process based on the liquid-liquid extraction technique. The method was demonstrated publicly for the first time recently during the laboratory's two open days.

In their search for cheapness the investigators have been using naphthenic acids, which cost about £130 a ton. This compares with a price range of £640 to £1,000 a ton for the alkyl-phosphoric acids used in the recovery of uranium. Commercial naphthenic acids, which are derived from crude petroleum oils and have extensive industrial uses, had not previously been considered for the recovery of metals from aqueous solutions. The Mineral Processing Division at Warren Spring is investigating the possibility of using them for the recovery of copper, nickel, cobalt, zinc and manganese by naphthenic acids, and the results are described as "extremely promising".

The metals which are extracted by the reagent depend on the *p*H of the aqueous solution of leach liquors. It has been found, for example, that copper is extracted at *p*H6, whereas nickel is extracted at *p*H8. Thus, by carrying out the extraction in two stages, first at *p*H6 and then at *p*H8, a separation of copper from nickel can be obtained. Practical tests are now being carried out. The same technique can also be used to obtain concentrated solutions of metals from very dilute solutions. This is achieved by adjustment in the ratio of organic to aqueous phases and in fact a concentration of up to ten can be obtained.

Pilot scale trials are planned to be started in the near future. It is also proposed to carry out chemical investigations in order to discover exactly how the naphthenic acids work in the separation. Such knowledge might lead to the use of particular fractions for still better separations.

The development of a process whereby metals could be profitably extracted from ores too low grade or complex to be economically worked by existing methods, would be an admirable achievement for Warren Spring. Though the project is of long range importance, with no immediate commercial significance, its potential benefits can scarcely be too highly assessed.

DREDGING FOR MICA

Already producing potash, phosphate and feldspar in considerable quantities, the International Minerals and and Chemical Corporation of Skokie, Illinois, U.S.A. has, over the past few years, launched out in the production of mica from a lake formed by the completion of a dam in the 1930s on the Nolichucky River in Tennessee and named Davy Crockett Lake.

At the bottom of this lake is reputed to be one of the largest known sources of flake mica and it is being mined by IMC with the use of a specially designed dredge.

Found in a five mile long delta on the bottom of the lake, the mica is said to lie over 40 ft. thick in places and the deposits to contain well over 500,000 tons of commercial grade material. Thought to be the only underwater mica deposit in the world, much of it originated up-stream on the Nolichucky River in the Spruce Pine district, where extensive mining has been carried out for over 50 years. Up to the last few years, the mica processing plants there could handle only the coarsest mica and the finer material was discharged into the river along with other waste material. This fine-grade mica, mixed with silt carried by the water, accumulated in Davy Crockett Lake, while the natural erosion by the river of mica-bearing land also contributes to the deposit.

In the IMC operation the dredge swings slowly in a radius of 42 ft., directing a suction hose over the mica bed, bringing to the surface with each pass some 1,700 gal. of water and mica per min. Pumps aboard the dredge then pass the slurry through as much as 2,400 ft. of floating pipeline to the plant ashore, where it is processed to remove foreign matter. The pattern of swings is seldom broken, except to clear roots and other obstructions from the bit, or to move the dredge by tug to another location. Care has to be taken to keep the pressure regular.

Dredging is co-ordinated with the needs of the plant ashore, contact being maintained by ship-to-shore telephone. In the processing plant the ore is beneficiated by flotation. The Crockett source, being constantly replenished by the deposit of more mica-bearing silt, is expected to have an unusually long life.

NUCLEAR BLOCK CAVING

Feasibility studies on the application of nuclear explosions to mining continue to emanate from the United States. Among the most recent of these are a report by R. E. Smith of the Sandia Corp. and a study co-authored by L. E. Sheffer, professor of mining at the University of California.

Both reports discuss the use of atomic blasting as a means of achieving fragmentation in orebodies too competent to be mined by caving methods in the ordinary way. After fracturing, the rock is drawn off through cones and finger raises or through draw points as with block caving. Mining costs comparable with those of conventional caving are anticipated.

The main advantage of this mining technique would lie in its almost universal applicability, given orebodies of sufficient size. Problems would inevitably result from residual radiation and heat, but there would appear to be no obvious technical or economic reason which would preclude its use, and in an era marked by continuous dwindling of rich mineral resources, this potentially low cost, large scale mining method is well worthy of note.

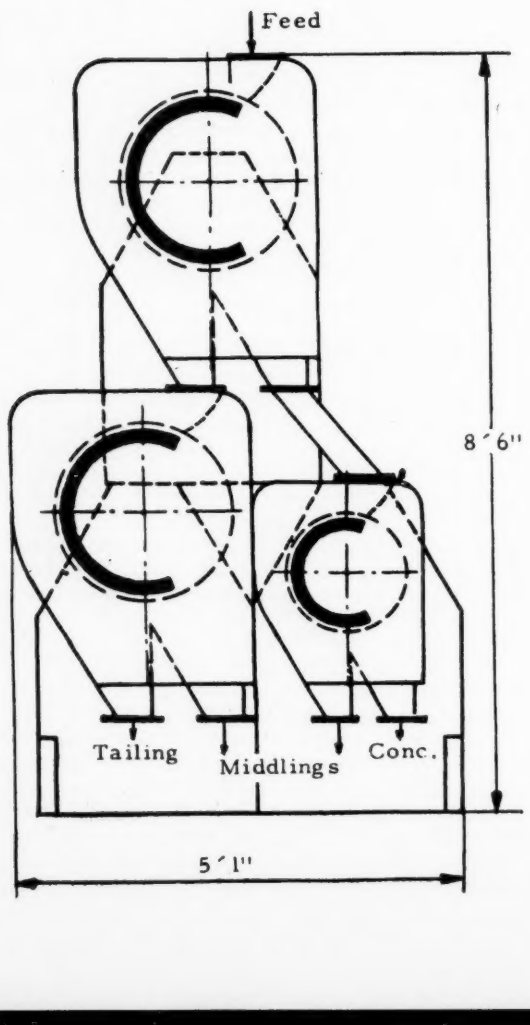
DRY CONCENTRATION OF MAGNETIC ORES ON THE SALA

AFTER a lump ore of magnetite is crushed down to about 4 in. or less, it sometimes pays to take off the "cream", when the ore is such that a high enough grade can be obtained. For this operation the Sala-Mörtsell high grade cobbing magnetic separator has been developed for lump ore. Grade can be controlled by utilizing the centrifugal force against the magnetic force, so that only high grade lump ore can adhere. This separator has a set of permanent magnets inside the drum covering a little more than half the circumference of the drum with high flux density and the drum is driven with variable speed to obtain exactly the wanted grade of lump ore.

In wet concentration of magnetic ores a typical conventional flowsheet might show ore first ground in a rod mill, followed by magnetic separation; the concentrate from these separators re-ground in a ball mill followed by the final separation. The disadvantages in this flow sheet are that in wet separators all magnetic material, including middlings, tend to be attracted in the magnetic field. Again, on wet separators it is usually only possible to attain two products: tailings and concentrate. Finally, in order to get a high grade concentrate it is necessary to grind the ore down to the size of the finest magnetite crystal size, which means that coarser magnetite particles have to be over-ground.

In most magnetite ores the free magnetite particles vary in size within the same ore body. The ideal treatment must then be to make a coarse grind in the first step and from this separate the clean magnetite particles and to re-grind the rest in order to also recover the fine particles. To accomplish this, it is absolutely necessary to obtain a middling in the first separation. This is impossible in a wet separation, but it can be done in dry separation with the Sala-Mörtsell separator.

Three drum unit of the Sala-Mörtsell separator



The Sala-Mörtsell Separator

The Sala-Mörtsell dry magnetic separator consists of stationary permanent magnets inside a rotating drum of non-magnetic material, stainless steel or plastic material. This drum is as standard made in two diameters, 600 and 400 mm. and is driven either with constant speed or through a variable speed reducer. The peripheral speed on the drum is usually between 2 and 7 m./sec. (7 to 23 ft./sec.).

Unlike earlier types which usually had a few pole pieces on a small part of the circumference, the Sala-Mörtsell separator is built on a new principle, i.e. with many permanent magnets mounted close together and covering about 230 deg. of the circumference.

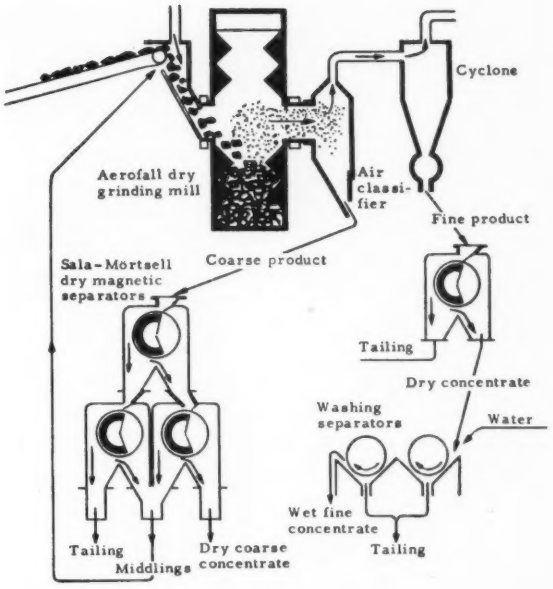
The feed is on top of the drum and the concentrate is taken off after it passes the last magnet. On acount of the numerous magnetic poles, the material on the drum turns over many times during the rotation of the drum and in this way the gangue is freed from the drum and is thrown off. The drum is fully enclosed in a dust-tight housing, which has two separate discharge openings, one for the concentrate and one for the tailing. The different products are separated by a baffle plate inside the housing.

The flux density of the permanent magnets is about 1,000 Gauss on the surface of the drum and the peripheral speed can be kept quite high without throwing off any magnetite particles from the drum. In this way it is possible to get a good clean concentrate and also a high capacity. The magnetite particles form chains on the drum. The length of these chains varies with the material's permeability and particle size, the field strength and the pole frequency. These chains turn between each magnetic pole and the tumbling of the material itself adds to the peripheral speed of the drum. This rotation of the magnetic particles themselves is a very important factor in the principle of this separator. The magnetic particles move around in a cloud on their way over the drum surface and by centrifugal force the non-magnetic particles are thrown off through this cloud without meeting much resistance. The centrifugal force can be varied by changing the speed of the drum and thereby the grade of the concentrate can also be controlled.

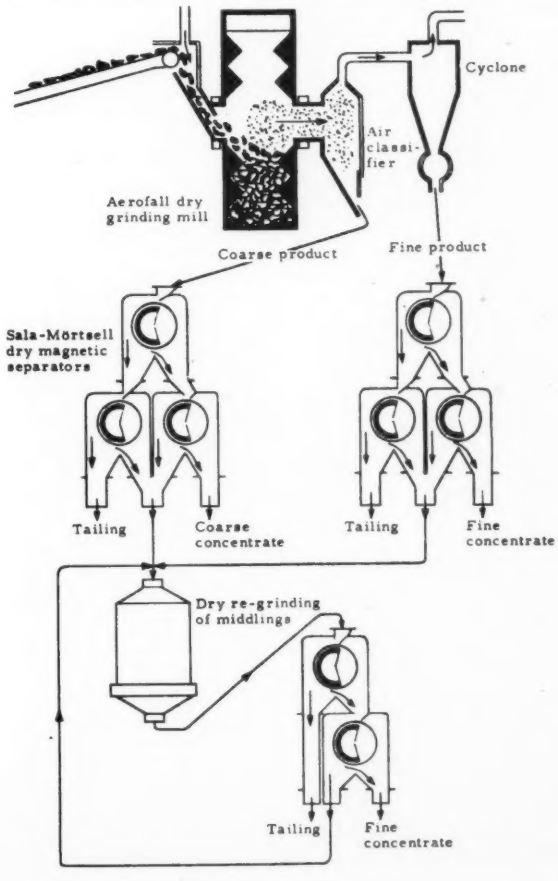
In full scale production the separation is usually done on 2 or 3 drums, built together in units. The first drum will in that case as a rule be 600 mm. and should be run at quite low speed to produce a clean tailing. The concentrate from this drum is fed to a high speed separator drum 400 mm. dia. From this second drum the products will be a high grade concentrate and a middling, which in most cases is re-ground and re-separated. In some cases there will be a third drum 600 mm. dia., to which the tailing

THE SALA-MÖRTSELL SEPARATOR

Magnetite ores have been the simplest kind of iron ore to concentrate ever since the magnetic separator was invented, and this as a rule both for lump ore and for fine ground concentrate. This fine ground concentrate has up to now been made through wet grinding and wet separation. The reason is that there has been no practical dry magnetic separators for fine ground magnetite. This article gives a comparison between the conventional method of wet grinding, followed by wet separation and dry grinding followed by dry separation. The author is E. B. Johanson, president, Sala Maskinfabriks A.B. Sweden



Above, a typical flow sheet of combined dry and wet separation. Below, a typical flow sheet of dry grinding and dry separation of a magnetite ore



from the first drum is fed. This third drum then works as a scavenger.

Dry grinding and dry separation have a number of advantages when compared with wet processing methods. Thus there is no water problem. In cold climates this is a very important factor (in wet plants processing low grade magnetite ores, about 3 to 4 tons of water is required per ton of concentrate produced).

The concentrate can be transported the year around and stockpiled either at the oredressing plant or at the harbour. Furthermore, transport, both on land and sea, is cheaper as are the buildings for the oredressing plant, since heating is not required.

Better metallurgical results also are obtained, with the coarser product for sintering, capacity per machine unit is higher, and tailings are less of a problem.

Plant Planning

When planning a new plant or rebuilding an old plant for dry concentration it is strongly recommended that very thorough tests, both grinding and separation tests, are made in order to get the best results. This test work should be done in a series with the same material in all tests in order to make up a "Grade and recovery diagram", giving grade and recovery at different speeds of the drum. From this diagram, the right speed of the drums in the different stages of separation can be determined.

When very fine ground material is considered, as for instance the fine particles from the multiclones in the Aerofall mill circuit, there are sometimes difficulties in getting a clean concentrate. This depends on an electrostatic phenomena, which binds the particles together so that they are hard to disperse in air. The Sala-Mörtsell separator will always give a clean tailing, but on account of these electrostatic forces, the fine ground concentrate must sometimes be run over a wet washing separator.

Malaya's Tin Industry After Restriction

MALAYA'S traditionally reticent tin producers are gradually making known their plans to increase production to meet the anticipated demand for tin from October 1, when export control comes to an end after 33½ months.

On the face of it, they do not have to go far to reach pre-control output levels. In what is now the last period of restriction to be declared by the International Tin Council, Malaya's permitted exports of 14,156 l.tons of tin during the three months ending September 30 are equivalent to over 95 per cent of the pre-restriction export rate.

Production in July (the latest month for which statistics are available) reached a rate of 4,398 l.tons metal content, compared with 4,997 in November 1957, the last full month before export control was imposed.

Yet the July production figure was achieved with 149 mines fewer in operation than in November, 1957. Actual figures are :—

	Dredges	*Other Mines*	*Total*
November, 1957	78	654	732
July, 1960	62	521	583

This recovery by Malaya's tin producers is all the more remarkable when it is remembered that less than 18 months ago 324 tin mines and dredges were closed down and 15,831 mineworkers were laid off as a result of six continuous months of the severest cut-backs in exports to be imposed. During these six months, Malaya had to restrict her exports—thus overall production—by more than 50 per cent.

Malaya's Opportunity

Whatever may be the longer term problems of the Malayan tin industry in consequence of her dwindling ore reserves and the inhibitions on prospecting owing to the government's land alienation policy, the lifting of export controls undoubtedly puts Malaya in an immediately very strong position. She is the world's biggest producer of tin and the biggest of the six producer members of the International Tin Council, who between them in normal times supply over 88 per cent of the free world's tin. Malaya's share of the permitted export total has always been in the region of 37 per cent; it now stands at 38.20 per cent.

Malaya's position will be further aided by the difficulty Bolivia is finding in filling existing permissible export amounts from her nationalized mines, the continuing strife in the Republic of Congo, and the now fairly firm reports that Indonesia's tin production is falling off due to the expulsion of the Chinese, many of whom were employed in the industry.

Yet another factor in Malaya's favour is that, unlike other producer members of the International Tin Council, her larger mining companies have built up a considerable tonnage of minehead stocks, as permitted under the terms of the International Tin Agreement. The actual amount is not known, but is believed to be in the region of three weeks' output, about 3,400 tons. These stocks, the building up of which enabled mines to keep employed more workers than they could otherwise have done, are ready for release, if need be, on October 1. Their quick sale at existing price levels will enable Malaya's miners to recoup some of the financial loss suffered since restriction was first imposed in December, 1957.

Malaya's tin producers have a considerable reserve of skilled mining labour on which to draw in order to bring back into production mines they were forced to close because of restriction, and to open up new mines. Before export control was imposed, 37,171 workers were employed on tin mines. By July 31 last the figure had moved up from its lowest level of 21,340 recorded after restriction on April 30, 1959 to 27,624.

Re-Expansion

It is doubtful whether the effect of the preparations now being made by Malaya's tin producers in readiness for October 1 will be apparent until mid-way in November when statistics issued by the Department of Mines for this month (September) become available. The actual number of tin mines in operation at the end of October will not be known until December.

Few mining companies have publicly announced their plans. Among those that have is Kent (F.M.S.) Tin Dredging Ltd., which is to restart its dredge as soon as possible and hopes to have it working by mid-October. Ayer Hitman Tin Dredging Ltd., is reliably reported to have postponed conversion of its second dredge to electric drive in order to take the fullest advantage of the lifting of export control on October 1. Conversion of the steam-driven dredge was expected to have taken nine months from October, and it is understood that the changeover has been put off until December at the earliest.

Since the decision to lift export controls was announced on August 26, Malayan Tin Dredging Ltd., has stated that its No. 6 Dredge closed down in August, 1958, because of restriction of output, was restarted on September 1. This year so far, this company has brought back into operation a total of four dredges which were closed because of export control, and now has five of its six dredges operating.

The restarting of dredges follows the progressive easing of restriction since April last year and this effect is reflected in a statement by the Anglo-Oriental Group of companies, the largest in Malaya. At the end of 1959, 10 of the 32 dredges under the company's management were closed down as a result of export control. Four of the closed-down dredges have already been brought back into operation this year.

However, lack of indication of plans from tin mining companies and from the Chinese miners is no pointer—activity *is* becoming increasingly evident in Malaya.

Revival of Chinese Mines

The Chinese miners, although considered individually as "small producers", constitute a very important part of Malaya's tin mining industry, as they provide over 40 per cent of the country's yearly output. They were particularly hard hit by restriction and at the peak of control had closed down 293 mines. By July 31 this year 188 more mines had been brought into operation to provide a total of 481 Chinese mines, as compared with 620 in operation before export controls were introduced.

Welcoming the decision of the International Tin Council, the President of the F.M.S. Chamber of Mines, Mr. D. R. Mitchell, said Malaya's tin industry had confidence in the Council's action. "We feel the decision must be right after having taken into consideration all the circumstances."

Belt Conveying up Steep Gradients

AN efficient high-angle belt conveyor system, for use in quarries and opencast coal mines of exceptional depth, can provide considerable economies in working and lay-out costs. The main problem in conveying materials up steep gradients is the tendency of the load to slip or roll but this has now been overcome by a new principle developed by a German company. It is reported that the high-angle belt conveyors have proved their high capacity and their ability to operate under strenuous conditions.

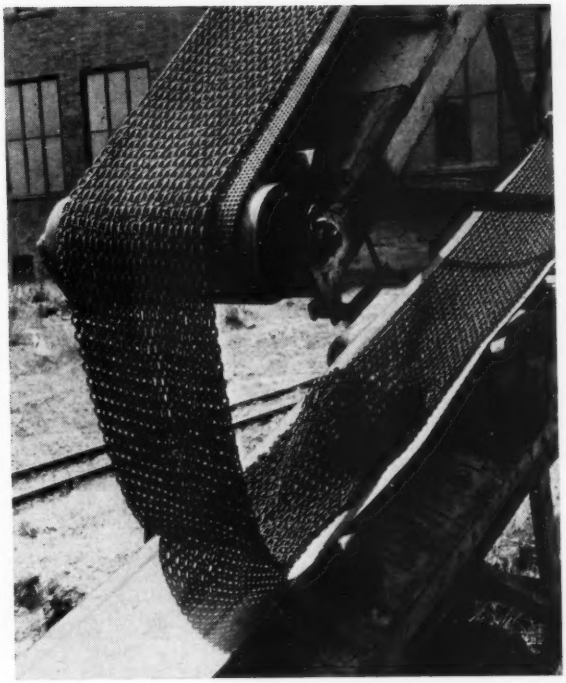
Consideration of the high-angle belt conveyor is interesting in light of the series of articles dealing with the use of belt conveyors in metal mines which is currently appearing in *The Mining Journal*. The solution to inclined belt haulage here described is yet a further indication of the increasingly flexible applications now being conceived for the belt conveyor in the mining industry.

The high-angle principle is very simple. An endless belt of flexible chain matting is laid over the load on the conveyor belt to prevent the materials from rolling or slipping. The weight of the mat depends upon the nature of the material and on the conveying angle involved.

The endless chain-mat moves at the same speed as the main conveyor belt but is itself carried independently by a supporting belt driven from a single drum unit mounted on the loading frame. Material need not be sorted before being loaded on to the conveyor belt for the longitudinal and transverse flexibility and the crosswise expandibility of the chain mat allows even the largest material lumps to be covered and prevents the escape of adjacent material. A special steel covering can be used to protect the conveyor belt when iron ore and other sharp materials are being carried.

In addition to covering the material and increasing the friction between the material and the conveyor belt by its weight, the chain mat assumes approximately 40 per cent of the total conveying effort. When the conveyor belt is empty the chain mat simply lies on it and rotates with it. The angle of the conveyor belt can be altered at will. Furthermore, it has been found that incomplete loading and stopping have no effect upon the ability of the chain belt to hold the charge without slip.

Richard Sutcliffe Ltd., hold sole British manufacturing rights for the system.



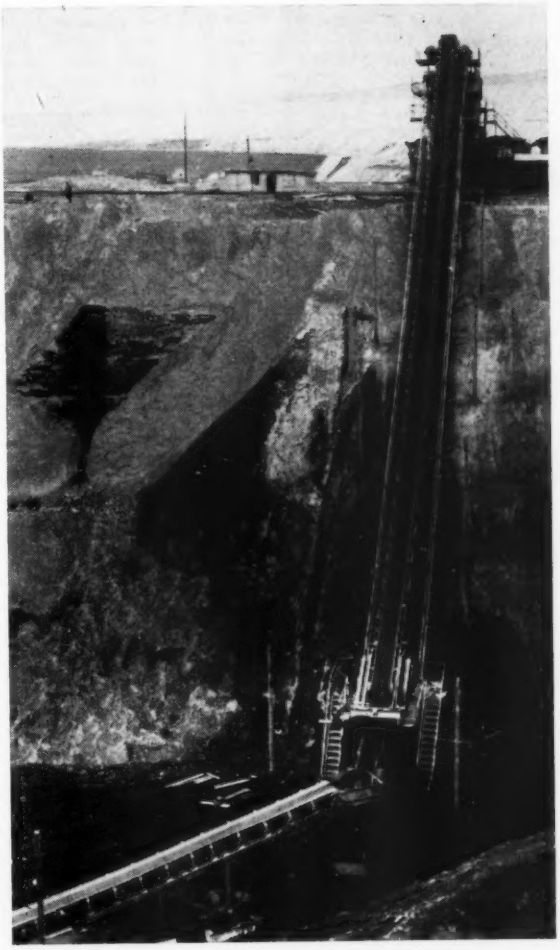


Illustration above shows how chain matting controls the load on the conveyor. The photograph below depicts a high-grade belt conveyor installation in Germany

Machinery and Equipment

Armoured Conveyor Production

Requirements of the armoured flexible conveyor, currently used in conjunction with power loaders in large numbers of U.K. mines, include the maximum resistance to abrasion combined with reasonable cost and trouble-free operation. At the railway wagon works of the Butterley Co. Ltd., considerable experience has been gained in the fabrication of welded conveyor system sections, whilst in addition, the repair of worn sections is carried out where these can be brought up to operating requirements by cutting out worn lengths and welding replacements.

The conveyor exists in a number of sizes, a typical conveyor, however, consisting of a number of 2 ft. wide sections each some 4 ft. 11 in. long and fabricated from ⅜ in. thick abrasion resistant plate. These sections or pans take the general form of a flat tray with flanged side pieces which enable a chain ladder of high tensile steel chain and scraper bars to be drawn through a number of joined sections, returning by flanges on the underside of the pan.

The conveyor is driven by a 40-50 h.p. motor at 1,460 r.p.m., through a gear box and fluid coupling, the coupling being employed to reduce shock loadings on the motor and transmission. The chain sprockets consist of a drum, cast in two halves which bolt together on the stub shafts of the drive, the sprocket teeth being cast or forged on a ring welded to each end of the drum.

The steel from which the main components are fabricated, is a high carbon/manganese steel containing a minimum of 0.30 per cent and a maximum of 0.35 per cent carbon, the manganese limits being between 0.50 per cent and 0.75 per cent. Sulphur and phosphorous contents are 0.05 per cent max. The Brinell hardness number of the steel is 149/192 and the tensile strength is in the range of 32/34 tons per sq. in. The pan bolt sockets are drop forgings of E.N.8 steel, these being stamped from bar lengths, frazed to remove excess material and then drilled out. The spill plates brackets are also drop forgings of E.N.8 steel whilst the half discs are of E.N.16 wrought steel.

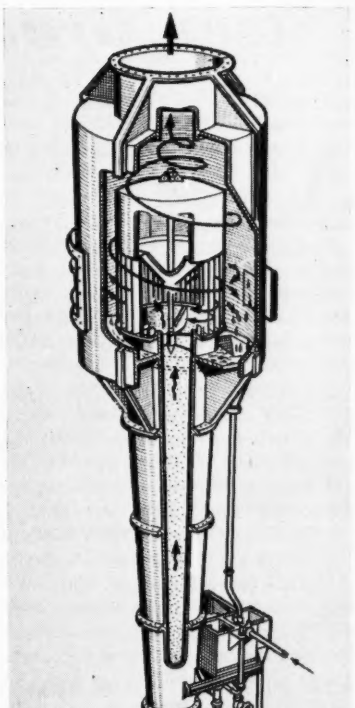
The main electrodes used in the fabrication of these conveyors at Butterley are Cooper and Turner Diadem Opal H.T.1 low hydrogen 4 gauge electrodes, the B.S. 1719 coding of these being E616 and the AWS—ASTM designation —E7061. The basic coating of these electrodes gives a clean weld metal, free of minute slag globules and gas inclusions, thus reducing the cracking tendency which arises when welding a steel of this composition without preheat. The weld metal also possesses matching mechanical properties, and has the facility of accommodating a high sulphur content in the parent metal where this is incorporated to improve machineability. Of particular importance is the high abrasion resistant property in this application where the welds will be subjected to constant grinding for long periods by the passage of the chain in grit laden conditions.

Below are shown stacked conveyor sections being tested for smooth running after welding with Diadem Opal HTI low hydrogen electrodes. Above right on this page, the Airmix wet collector

A NEW WET COLLECTOR

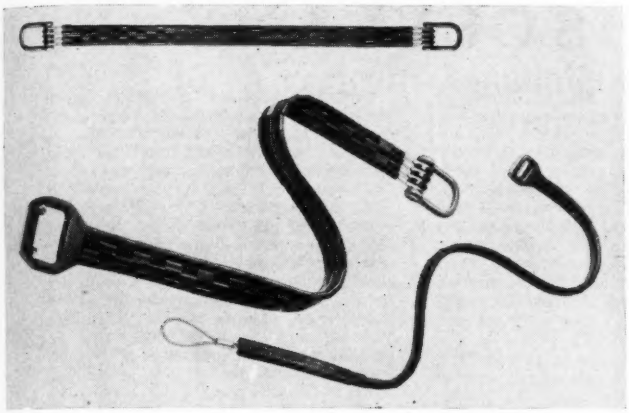
The Airmix wet collector which has just been developed has a variety of uses in applications involving industrial dust collection. Apart from its use on new systems, it is easily adapted for installation as a secondary collector on existing plants where increased efficiency is desired.

This device is a self-induced spray type vertical venturi wet washer which separates the dirty water from the



cleaned gases by means of centrifugal action. The washing water is fed tangentially to the venturi throat by two, three or four pipes depending on the size of the collector. The gases flowing through the throat at high speed spread the water on to the cylindrical surface in a continuous film and at the same time carry it vertically. The great difference in the velocity of the two fluids causes the gas to break up the waves which form on the surface of the water film thus intimately mixing the dust laden gas and the water droplets in the fine spray produced.

The mixture then enters a tapered diffuser section where its speed is slowed down and the dust particles which have so far escaped are wetted as the dust laden gas again passes through a cloud of water droplets which, owing to their tendency to agglomerate, have a slower upward movement.



Three of the improved Talurit safety slings

Upon reaching the top section of the Airmix the mixture is diverted into a ring of curved vanes which impart a strong rotational motion which separates the gases and water by centrifugal action. Any particles still in a dry state are wetted by impingement with the vanes. The dirty water is evacuated by a discharge pipe and the cleaned gases pass out through a chimney.

There are two types of sludge disposal system available, one consisting of a small three-compartment tank which separates the slurry through a discharge valve and another consisting of a large two-compartment sludge settling and dewatering tank in which the sludge is allowed to settle for eventual discharge down a chute into lorries for disposal, the clean water being fed in both cases back to the venturi.

The Airmix has been successfully used on coal, coke, in the foundry and quarrying industries and in many other fields. It has been used in the chemical industry for the drying of chlorine, for the washing of nitrous, sulphurous and ammoniac vaporus and as a pre-filter before a wet electrostatic filter.

The unit is constructed of mild steel and is available in a range of standard sizes with capacities from 1,300 c.f.m. to 30,000 c.f.m. For handling larger volumes a number of smaller units can be operated in parallel. A galvanized finish or, for certain applications corrosion resistant linings or special materials such as stainless steel can be supplied. Full detail are available from Thermix Industries Ltd., a member of the Dunford and Elliott Engineering Group.

IMPROVED SAFETY SLING

An improved Talurit safety sling has been introduced by Cable Covers Ltd. These new safety slings can be supplied in any length, any width, any lifting capacity and with a wide variety of terminations amongst which are shackles, reeving links, soft eyes, crescent thimbles and enlarged thimble eyes. These terminations can be fitted at each end of the sling or a combination of any two terminations, one at either end of the sling.

The improved sling incorporates the Talurit wire rope mechanical splice, and is covered with special grade PVC protectors which are oil and chemical resistant and function perfectly at temperatures from −22 deg. F. to +140 deg. F. The sling will not kink or twist and the PVC protectors, which have an extensive working life due to their high resistance to abrasion can, when necessary, be replaced individually.

The construction of the Talurit sling is such that inspection of all slings can be undertaken in a matter of minutes without the employment of any special tools or gear. The sling gives complete protection to personnel and offers the ideal solution to the handling of products which are fragile, valuable or irregular in shape.

MORE ELECTRIC WHEEL NEWS

Power, performance and bonus productivity are features of the new Lectra Haul 55-ton pay load diesel electric truck, declares the manufacturer, Unit Rig Equipment Co., Tulsa, United States. In recent demonstrations, reports the company, the 41 ft. long truck showed remarkable manoeuvrability and versatility in turning, climbing, starting, stopping and dumping. Powered by a 600 h.p. Cummins VT-12 diesel engine that generates current for GE electric motors mounted in the rim of each wheel, the vehicle is expected to cut hauling costs from 10 to 30 per cent.

Motorized wheel drive eliminates torque converters, transmissions, propeller shafts and drive axles, thereby reducing drive system maintenance. Electro-dynamic brakes, a feature of the machine, are reported to provide highest continuous braking without fading or mechanical wear. Longer life, lower maintenance expense and maximum use of power and equipment are a result.

The Lectra Haul requires no more effort to steer and brake than a much smaller conventional truck, it is noted. It has a conventional arrangement of steering wheel, foot throttle, brake pedal and other controls, eliminating special driver training. There are no gears to be shifted.

In tests, the machine was loaded with 55 tons of limestone and driven up a 6 per cent grade at 8 m.p.h., demonstrating its ability to perform with a full pay load. The entire load was dumped in just 23 sec. by means of hydraulic rams. The vehicle will take grades up to 15 per cent fully loaded, cutting haul length and reducing road maintenance expense.

After leaving the bottom of a pit, reports Unit Rig, the truck was run at high speed with full load making gross weight 110 tons, and was brought to a fast easy stop, demonstrating the effective holding power available with electric motors for dynamic braking. Parking and emergency brakes employ hydraulic aircraft disc types on all four wheels with no-friction brakes for downgrades included.

General specifications are: length, 21 ft. 8 in.; width, 14 ft.; height, 14 ft. 4 in.; wheelbase, 21 ft. 5 in.; gauge, centre to centre, front tyres, 9 ft. 9 in.; gauge, centre to centre, rear tyres, 10 ft. 9 in.; and ground clearance, minimum trailer frame, 2 ft. 3 in.

VERMICULITE CONCRETE IN COAL MINES

A novel use has been found for vermiculite concrete in coal mines. It is being used in pits in No. 1 Area of the East Midlands Division, N.C.B., for filling large roof cavities following falls of rock. These cavities have to be filled in order to prevent further falls of rock and the build-up of methane gas with the consequent danger of fire and explosion. Vermiculite concrete is completely incombustible.

The filling of cavities presents great difficulties as it is dangerous to go up into them, and the placing in position of suitable filler materials presents obvious problems.

The light weight of vermiculite concrete makes it especially suitable for this purpose plus its unique feature of compressibility. This lightness plays a threefold role. In the first place, the vermiculite is easy to transport in bags underground. A 4 cu. ft. sack is so light that a man can easily carry it under his arm. Secondly, the vermiculite concrete is simply blown into place by compressed air. Thirdly, the load on the roof of the roadway is far less than with dense concrete. Vermiculite concrete weighs only about 35 lb./cu. ft. as against 140 lb./cu. ft. for standard concrete. The vermiculite is being prepared and supplied by Dupre Vermiculite Ltd., who worked with No. 1 Area headquarters to develop this application.

DUST EXPLOSION TESTING

Standard laboratory tests of dust explosibility, developed over the years by the U.S. Bureau of Mines, are described in a publication released recently by the Department of the Interior.

The report, of interest to a wide variety of research laboratories and industrial plant, is aimed at promoting a better understanding of the Bureau's testing methods so its findings regarding industrial dusts will be more useful in lessening the hazards of explosions.

Since the Bureau's establishment in 1910, much of its research regarding the explosibility of dusts has centered on coal dust. A brief historical summary of this is included in the illustrated report.

A copy of Report of Investigations 5624, *Laboratory Equipment and Test Procedures for Evaluating Explosibility of Dusts*, can be obtained from the Publications-Distribution Section, Bureau of Mines, 4800 Forbes Ave., Pittsburgh 13, Pa. It should be requested by number and title.

MINING MISCELLANY

The Mines Division of the Tanganyikan Ministry of Commerce and Industry is arranging a second course of instruction for prospectors in Morogoro between October 11 and 29, on the same lines as the course held in April last. It will cover the simpler aspects of prospecting, mining and preparation for the market of mica, as well as the winning and recognition of other minerals in the Tanga and Eastern Provinces, and adjoining areas. Instruction will also be given on certain aspects of mining law in Tanganyika.

★

The South American Gold and Platinum Co. is reported to be planning large scale gold operations on the west side of the Osa peninsula, Cost Rica. If these explorations confirm preliminary indications of placer gold, the company may invest up to $U.S.2,000,000 for the carrying out of mining operations and in addition may earmark a further sum for the establishment of a gold refinery.

★

The draft law amending the existing Mining Code of Costa Rica has been submitted to the Assembly, but at latest reports little progress had been made in discussing its proposals. The government is being pressed to take prompt action in the matter so that Alcoa may continue its activities in the country. Meanwhile, a local subsidiary of the International Iron Corporation of Houston (Hierro Internacional de Costa Rica Ltda.) has applied for exclusive one year mineral exploration rights to a large area of land in Guanacaste province. Exploration is expected to commence later in the year.

★

It has been stated that Bukitasam, the largest of Indonesia's State-owned coal mines, has achieved an annual production of 550,000 tons. Expansion work begun last year is still held up because of questions still awaiting settlement with the Central Government.

★

The Nitto Mining Co, a leading Japanese copper smelter, has announced the conclusion of a contract to purchase 11 mining districts in the Bolivian Andes. The deposits are estimated at 2,400,000 tons with an average copper content of 4 per cent. It is reported that the company hopes initially to mine 100 to 150 tons of copper ore monthly for shipment to Japan. Construction of a dressing plant is planned. The processing rate will be 10,000 tons per month by 1962.

★

The construction of the world's first automated hydraulic coal mine has begun in the Kuznetsk coalfield in Western Siberia. The mine is planned for a production rate of 4,000 tons a day.

★

Productivity in the U.S. coal industry reached a new high of more than 12 tons per man per day in 1959. The advance in production rate was attributed mainly to increased mechanization. According to the U.S. Bureau of Mines, a record of 86 per cent of coal won underground was loaded mechanically in 1959. The increase in output per man day is nearly a ton a day over that recorded in 1958, when slightly less than 85 per cent of underground production was loaded mechanically. The 1959 production figures are presented in a supplement to the Bureau's *Weekly Coal Report*, 2242. Copies can be obtained from the Branch of Bituminous Coal Economics, U.S. Bureau of Mines, Department of the Interior, Washington, 25, D.C.

★

The High Authority of the European Coal and Steel Community has allotted £1,000,000 from its levy funds for a second four-year programme for industrial health and medicine. The money will be used mainly to continue research projects which proved their value in the first programme. They are, research into silicosis and emphysema, the effects of environment and individual features on the working capacity of a labour force, serious burns, mine safety, scientific cooperation, training of young research workers, and technical aid in documentation and information.

★

A significant deposit of a new beryllium ore is reported to have been discovered in the Topaz Mountain area of Utah, about 150 miles from Salt Lake City. Officials of Vitro Minerals Corp., one of the largest claim holders in the Topaz Mountain area, have revealed that the new ore is found in disseminated non-pegmatic deposits, much of it lying close to surface where it can be mined by openpit methods. Studies by the company have revealed that the ore apparently is amenable to conventional hydro-metallurgical processing. Laboratory studies are being carried out.

★

A plan drawn up for the Greek Government by the West German consultant firm of Büro Dr.-Ing. Lueth, recommends the introduction of Greek iron ore from deposits on the islands of Thasos, Seriphos and Crete as feed material for the annual production of 60,000 tonnes of steel semi-manufactures at present produced from a scrap base, and at the same time increasing annual output to a level of 250,000 tonnes. The Greek Government may take this plan up through its newly-formed Industrial Development Corporation, and the project also foresees the use of combustion coke made by the Lurgi process at the Ptolemais brown coal site from indigenous lignite for low-hearth furnace firing, if the coke proves suitable.

★

According to the Turkish Mining Research Institute, nickel deposits have been discovered by the Institute's geologists on the Samsun-Dag and Kirha-Dag mountains, south of Izmir on the River Meander. It is believed that the U.K., the U.S. or Western Germany could be interested in exploitation of these reserves, and specimens of the ore have been sent to Britain and Germany.

First shipments of phosphate ore to Holland, France and Japan, have been made from the Taiba deposits in Senegal, where production has been started by Compagnie Senegalaise des Phosphates de Taiba. The Taiba deposit, situated some 62 miles from Dakar, is estimated to hold some 40,000,000 tonnes of ore, and annual exploitation will be at the rate of 600,000 tonnes of concentrates. The exploiting company is owned 35.8 per cent by the Bureau de Recherches Geologiques et Minieres, 19.7 per cent by COFIMER, 12.5 per cent by Pierrefitte and 12.2 per cent by Péchiney.

★

During the first half of 1960, Israel exported polished diamonds worth some $U.S.28,000,000, which is almost 28 per cent higher than the figure of $22,400,000 recorded for the same period of 1959. Exports to the U.S. have remained unchanged, but those to the U.K., Switzerland and Hong Kong showed marked increases. The Ministry of Trade is understood to be negotiating with De Beers' Central Selling Organization for increased allocation of rough stones. Israel's import from this source in the first half of this year was only 18 per cent of her total imports of uncut stones.

★

Cyprus exports of copper concentrates during the first half of 1960 were 66,253 tons (compared with 67,420 tons in the same period of 1959); copper cement, 1,220 tons (1,498); copper pyrites, 145,727 tons (149,449); umber, 1,788 tons (2,218) and bentonite 111 tons (916). Increases in quantitative exports were reported over the period for iron pyrites at 413,877 tons in 1960 (361,109 tons in 1959); chromite, 5,500 tons (2,345); gypsum, 57,902 tons (23,635); yellow or red ochre, 194 tons (162); and asbestos, 5,416 tons (4,350). (All tonnages are in long tons.)

★

Asbestos deposits of over 100,000,000 tonnes have been located in the Argentine province of La Rioja, according to studies undertaken by the West German concern Rheinstahl-Planung. The exploitation of the deposits would enable Argentina to stop importing asbestos, which is now at an annual rate of $U.S.5,000,000. The owners of the La Rioja deposits, Senores Juan and Carlos Casale, have announced their interest in obtaining foreign help in the exploitation of the asbestos, either in the form of technical aid and financing of the necessary equipment, or by the formation of a joint foreign-Argentine exploitation company.

★

Holman Brothers Ltd. has been selected by a group of American mining experts to receive a 1960 Blue Ribbon Mining Award for outstanding achievement in equipment development aiding the technological advancement of the mining industry. The award, which has been sponsored by the American publications *Mining World/World Mining*, is in respect of the Holman Rotair—the first British portable screw-type rotary compressor.

Metals and Minerals

Check to American Aluminium Growth

The present uncertainty about the North American economic outlook is underlined by current primary aluminium production trends in the United States, where production for the first six months of this year totalled 1,007,000 s.tons against 942,000 s.tons in the corresponding period last year. Now, indications are that the third quarter production will be below the 520,000 tons produced in the third quarter of 1959, which is hardly surprising considering that by the end of July producers' stocks were at a record level of over 200,000 s.tons.

A small cutback has also been announced by Alcan, which is shutting down one of its Arvida units. This may be little more than a token reduction as it is expected to cause a curtailment of only 17,000 s.tons a year. Alcan attributes this cutback entirely to the weakness of the North American market, pointing out that elsewhere sales continue good. Clearly much depends on how the European market behaves in the coming months, a matter on which some of the U.S. producers—notably Reynolds—are said not to be unduly optimistic.

★

Annual production of aluminium in Minas Gerais, Brazil, is expected to amount to 130,000 tons by 1965 compared with the official production target of 42,000 tons according to *The Fortnightly Review* of the Bank of London and South America. At present Brazilian output of aluminium is only about 16,000 tons a year.

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Aluminium Limited's principal fabricating subsidiary, formerly known as the Northern Aluminium Co. Ltd., has changed its corporate name to Alcan Industries Ltd. Started originally in 1909 as a sales outlet in Britain for Canadian aluminium, Alcan Industries Ltd. has been expanded through the years into a $50,000,000 fabricating operation. Its newly expanded plant at Rogerstone, South Wales, contains the largest aluminium rolling mill in the world outside the U.S. It will be capable of rolling plate to widths of 11 ft. for use in shipbuilding, as well as wide sheets for structural and transportation uses. The new mill will be formally inaugurated on October 1. The change of the British company's name involves no change in ownership, manufacturing activity, or sales policies.

CHROME ORE PROSPECTS

Now that the holiday season is well on the way out, there are signs that the chrome ore market in the U.K. is beginning to liven up. In a number of instances buyers are enquiring about supplies for 1961 and a more optimistic feeling regarding the market outlook now prevails. The enquiries are reported to be emanating from the U.K., the Continent and the Far-East. It remains to be seen, however, whether the business which matures will have any effect on prices. Since the general supply position of ore appears adequate, it may well be that future buying will serve only to sustain present levels, rather than to inject a steadier tone.

U.K. imports of chrome ore during July amounted to 34,489 l.tons, according to Board of Trade statistics, lifting the tonnage brought in over the January-July period to 155,374 tons compared with 88,033 tons in the corresponding period of last year.

★

Turkey is to supply 140,000 tons of chrome ore to the U.S. in exchange for wheat. In announcing this agreement the Etibank—which is the holding company for the State-owned mines—said that it would ship 40,000 tons of chrome ore, the balance being supplied from the private trade.

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The Nippon Kokan Kaisha, a Japanese steel and ferro-alloy producer, was recently reported to be negotiating for 2,000 tons of lumpy chrome ore, 4,000 tons of chrome concentrates, and 1,000 tons of manganese ore from Southern Rhodesia for shipment by the end of this year. These imports are required to relieve a shortage of material normally imported from the Philippines.

★

The General Services Administration of the U.S. Government announced recently that no acceptable bids had been received on July 5 last for the purchase of approximately 1,600 l.tons of chromite and 100 l.tons of nodulised chrome concentrates. In August, 1959, these were declared surplus to the needs of the U.S. national stockpile of strategic materials.

Since this announcement, the G.S.A. has stated that it will sell about 90,000 l.tons of chromite from the stockpile through competitive bidding after the mandatory six months' waiting period has elapsed. The ore will be low grade and of domestic origin.

U.S. QUICKSILVER INDUSTRY

Quicksilver production at domestic mines in the second quarter of 1960 increased by 9 per cent to 7,620 flasks, report the Bureau of Mines, U.S. Department of the Interior. During the first six months of 1960, however, mine output totalled 14,630 flasks compared with 16,170 flasks in the corresponding period of 1959. General imports of 6,734 flasks more than tripled receipts in the first quarter. Industrial consumption remained virtually unchanged. Stocks held by consumers and dealers rose by 1,400 flasks to 11,700 flasks and producers' stocks were more than double those held at the end of March.

Quicksilver prices were fairly constant during the quarter, ranging from $214-$216 a flask at the beginning to $211-$214 at the end. The quarterly average of $212.20 was only $0.20 less than that of the preceding quarter.

★

A subdued tone continues to characterize the London quicksilver market and the majority of dealers now suggest £69 per flask for London ex-warehouse metal. A certain amount of metal is said to be available on the spot, but buyers are still not showing much interest.

URANIUM ORE RESERVES

The Atomic Energy Commission estimates that reasonably assured U.S. domestic reserves of uranium ore concentrates total 240,000 tons, while total assured Free World Reserves are about 1,000,000 tons. These estimates were contained in an A.E.C. report of uranium and coal reserves prepared for the joint Congressional Committee on Atomic Energy.

The A.E.C. study did not comment on the adequacy of these reserves states the *Wall Street Journal*. However, in its annual report last year A.E.C. showed annual procurement requirements of 33,326 tons of concentrate from domestic and foreign sources and noted that: "U.S. reserves, together with the large orebodies already developed throughout the Free World, provide sound support for a broad nuclear power programme."

The estimates given above refer to concentrate that could be recovered at a cost of $8-$10 a lb. Many current commission contracts with domestic uranium millers are for purchase at $8 a lb.

INDIAN MICA EXPORTS

Our Correspondent in India reports that in 1959 a total of 330,970 cwt. of mica of various descriptions, valued at Rs. 87,220,000, was exported through Calcutta in 1959. The principal importers of Indian mica were the U.S., Britain, Japan, France, Italy and Russia. The U.S. took about 35 per cent of the total shipments.

According to the Indian Mica Miners' and Dealers' Association, the solution of the problem faced by the mica industry lies mainly in organizing the trade so as to inspire confidence in the buyers in foreign countries. A Mica Export Promotion Council has already been set up. The Association notes that the U.S., which is the principal buyer of Indian mica, is reported to have decided to import mica from Brazil and is also investing substantial capital in the development of the mica industry in that country. The Association considers that, since exports to Western countries—particularly to the U.S. and the U.K.—are declining, it would be helpful to the Indian mica industry if efforts were made to promote sales to European Communist countries. The Mica Export Promotion Council, it is stated, is already considering certain projects in this connection.

U.S. SELF-SUFFICIENT FOR BERYLLIUM?

Speaking in Salt Lake City last weekend, Mr. Bruce Odlum, president of Beryllium Resources Inc., said he believes that beryllium minerals exist domestically in sufficient quantity to free the United States from its dependence on foreign ores.

There is no indication in the reports of Mr. Odlum's statement whether this confidence is based primarily on important new domestic resources having come to light or whether American producers have made some important breakthrough

in mineral separation technique which has hitherto been an obstacle to the economic working of many large low grade deposits.

Hitherto the U.S.A. has been importing about 70 per cent of world production. U.S. consumption last year was around 6,200 tons and may now be as high as 7,500 tons of ore averaging about 12 per cent metal content.

JAPANESE MANGANESE IMPORTS

Japan expects to increase her imports of manganese from Australia in the year ending March, 1961 to a total of 40,000 tons against 17,000 tons in the previous year. This year's imports would represent about 15 per cent of Japan's requirements, which are still met primarily from India.

Coming Events

Sir Alexander Fleck, president of the Society of Chemical Industry, will open the Corrosion and Metal Finishing Exhibition to be held in the Empire Hall, Olympia, London, from November 29 to December 2.

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The Tenth Electrical Engineers Exhibition will be held at Earls Court, London, from March 21-26. Signalling and Communications will be special features of the 1961 show.

★

The Eighth Mechanical Handling Exhibition is to be held at Earls Court, London, from May 8 to 18, 1962. The exhibition is open to manufacturers throughout the world, and applications for space are already being received.

★

An International Exhibition of Fire Fighting Apparatus and Safety Equipment, under the name "Interschutz", is to be held in Cologne, June 23 to July 2, 1961. The organizers are the Vereinigung zur Forderung des Deutschen Brandschutzes, in co-operation with the Cologne Fair Management.

★

The Engineering Centre and the Board of Trade are organizing, jointly for the second time, a group display of "British Engineering" at the National Production Show of Canada, Toronto, May, 1961.

COPPER · TIN · LEAD · ZINC

(From Our London Metal Exchange Correspondent)

All four metals have had a quieter week with sentiment being affected by the continued weakness in Wall Street and continued talk of over-production.

SPOT COPPER UNDER SALES PRESSURE

The price of copper on the London market has eased under persistent and wide selling, some of which has been encouraged by the re-establishment of a contango. The actual price movement might have been much greater had there not been "an influential buyer" operating on most days. Stocks in official warehouses rose a further 340 tons, bringing the total at the beginning of the week to 9,133 tons. Consumers, both in the U.K. and on the Continent, appear to have adopted a more cautious buying policy in the expectation that prices might weaken still further. It would not be surprising, however, if the Eastern *bloc* buyers become more active at around the lower prices now ruling.

In the U.S. some reports indicate that there is a little more interest being shown in the red metal, but at the present rate of demand it seems that the producers will be accumulating stocks; customs smelters may have some difficulty in disposing of all their output especially in view of the lower European levels which are making shipment less attractive. Dealer copper is still changing hands at around 31 c. per lb., and customs smelters have reduced their intake price for No. 2 scrap to 24½ c. per lb.

The latest statistics available for the U.S. show that domestic consumption, by brass and wire mills and foundries, based on their shipment of fabricated products in August, reached 107,616 s.tons as compared with the very low figure of 75,650 tons for July. New business also showed a substantial rise at 103,750 tons as compared with 69,861 tons in July: unfulfilled orders were slightly lower at 122,415 tons, as also were fabricators' stocks of refined copper at 457,421 tons.

The situation in Chile appears to be becoming more disturbed as apart from talks going on at Chuquicamata, in an attempt to avoid a walk-out at the end of this week, there are also rumours of trouble at Braden's El Teniente mine although the labour contracts there do not expire until the end of the year. It is considered in London that the Chilean Government will do all in its power to stop a strike in the copper industry as the country's finances are still suffering from the severe earthquakes earlier in the year.

TIN QUIET AS CONTROL ENDS

The tin market has been quiet with the backwardation being maintained at a relatively small figure. Stocks rose 18 tons to 9,263 tons. In Singapore the market continues at a relatively level figure and with turnovers showing little indication of any de-stocking on the part of holders of metal. On Thursday the Eastern price was equivalent to £806¼ per ton c.i.f. Europe.

MOTOR RECESSION SLOWS LEAD-ZINC

Both the lead and zinc markets have suffered from lack of buying and had it not been for the backwardation in zinc the price of that metal would probably be several pounds lower. Consumers of both metals are adopting a waiting attitude and with the shadow over the motor trade of the world there is little incentive for buying more than is absolutely required.

As is to be expected, the lead market has shown more signs of resistance than that in zinc—the former has been out of favour for many months and there was a considerable bear position, some of which has been covered after the price broke through the £70 per ton level. In zinc the persistence of a backwardation tended to keep bears out of the market and therefore there is less likely to be any technical resistance to further price declines.

NEW L.M.E. CONTRACTS

It will be interesting to see what quotations emerge next week when dealings on the new L.M.E. "in warehouse" contracts start for prompts on and after January 1, 1961. This means in practice that for the next three months the first two quotations for lead and zinc will be in respect of half-monthly settlement periods whereas the two forward quotations will be for delivery prompt exactly three months ahead as is now the case in copper and tin.

★

The British Bureau of Non-ferrous Metal Statistics for July show (with the corresponding June figures in parentheses):—a consumption of copper of 46,306 l.tons (65,398 l.tons) whilst stocks of refined and blister copper at the end of July totalled 98,083 tons (71,391 tons). Lead usage in all forms totalled 27,913 tons (33,318 tons) the main drops being in the cable and sheet and pipe trades. Stocks of refined lead at the end of the month totalled 53,069 tons (46,542 tons) and during the month exports and re-exports increased to almost 3,000 tons as compared with under 100 tons in June. Imports from Spain were almost halved at 2,367 tons. Offtake of zinc was 25,594 tons (33,058 tons), and stocks of zinc at the end of the month amounted to 55,362 tons (52,004 tons). Refined tin usage totalled 1,638 tons (2,133 tons) whilst end of month stocks were 11,797 tons (11,113 tons).

Closing prices are as follows:

	September 22 *Buyers*	*Sellers*	September 29 *Buyers*	*Sellers*
COPPER				
Cash	£235	£235½	£230½	£231
Three months	£236	£236½	£232	£232½
Settlement	£235½		£231	
Week's turnover	9,025 tons		8,875 tons	
LEAD				
Current ½ month	£69½	£69½	£68⅞	£68¾
Three months	£69½	£69⅝	£69⅛	£69⅜
Week's turnover	7,500 tons		6,725 tons	
TIN				
Cash	£806	£806½	£804	£804½
Three months	£804	£804½	£801½	£802
Settlement	£806½		£804½	
Week's turnover	625 tons		590 tons	
ZINC				
Current ½ month	£87½	£87⅝	£87	£87½
Three months	£86½	£86½	£85½	£85⅝
Week's turnover	6,925 tons		6,650 tons	

London Metal and Ore Prices appear on Inside Back Cover.

Mining Finance

Generous Platinum Share Dividends

The recovery in the metal price, the profits forecast made by the Board last March and the company's resumed payment of interim dividends, had made it obvious that there was going to be a sharply higher distribution by Rustenburg Platinum Mines, the big South African producer, for the year to August 31. But, as was officially indicated, how great an increase depended on the course of events between March and August which would determine how much of the profit it was thought advisable to retain.

In the event relatively little has been retained and the dividend on the £1 shares has been raised from 26s. 3d. to 49s. 9d. by the declaration of a final of 34s. 9d. a share. Thus, £2,160,000 is being paid out from a net profit for the year of £2,423,000. In 1958-59 only £1,140,037 was distributed from a net surplus of £2,973,347. The lower net profit figure on the present occasion is due to a sharp increase in tax liability, the provision in this respect being £1,001,000 against only £267,777. The higher charge reflects the lessening of the capital expenditure redemption allowance, an allowance that had been running at a substantial level in former years owing to the company's big programme of expansion.

The appropriation for capital expenditure is on the present occasion only £56,000 whereas it was £1,006,168 a year previously. The carry-forward is raised from £795,299 to £917,000. Capital expenditure for 1960-61 is put at £300,000.

Rustenburg's capital of £868,600 is held as to 43.3 per cent by Potgietersrust Platinums, 39.2 per cent by Waterval (Rustenburg) Platinum Mining and 17.5 per cent by Union Platinum Mining. These companies usually pay out in full the income that they receive from the producing concern on these holdings. The interims and finals for their years to October 31, 1960, are shown in the following table compared with the single payments for 1958-59.

	1958-59	1959-60	
	Total	*Interim*	*Final*
	s. d.	s. d.	s. d.
Rustenburg	26 3	15 0	34 9
Potgietersrust	9	5	1 0
Union	1 1¾	8	1 7½
Waterval	1 3	8½	1 8½
Lydenburg	10	5¼	11¼

Lydenburg Platinum has no direct holding in Rustenburg. It is, however, indirectly interested through its 26 per cent stake in Watersval.

As usual, Rustenburg gives some interesting observations on the platinum situation with its preliminary statement. The average price in the year to August 31 was £29 11s. 4d. an ounce compared with £24 13s. 3d. in the previous year and with the level of £30 5s. that has been maintained since last January. But, contrary to expectations, the company's platinum sales failed to expand, being much the same as for 1958-59. This was due to active market conditions in the first half of the year to August being followed by a period of "relative inactivity".

Reduced sales in the United States owing to the lower level of industrial activity there was one reason for this setback. Another was a reduction in buying following the brisk trading early in 1960 that followed the last price increase. It is pointed out, however, that there is a normal seasonal decline in the platinum market during the middle of each year from which "some recovery may now be expected".

Rustenburg has continued to build up stocks of platinum and by-product metals in order to be able to meet any spurt in demand. This is probably the reason for unofficial Johannesburg reports over the past few months that the company has been working at a high level of capacity. It is also now confirmed that the new reduction plant completed in 1957 was commissioned during the year.

On the basis of the latest dividends the South African platinum shares give high yields of around 15 per cent. That on "Pots", for instance, at 9s. 9d. cum 1s. gross dividend is 15.5 per cent. Such large returns reflect partly the political risk and partly fears that the platinum price may have to be reduced if the U.S. trade recession goes on.

SOUTHERN KINTA TO REPAY 2s.

The autumn dividend season for Far Eastern tin companies has opened with a surprise. Southern Kinta Consolidated, one of Malaya's largest producers, is not only raising its payment, which was, of course, expected, but is to make a capital return of 2s. per 4s. share. This was quite unexpected because of the expense that looms ahead for this concern in transferring some of its nine dredges to new ground. It was thus thought that the ample funds which the company had in hand at the end of March, 1959, would be reserved for this purpose.

The decision to distribute £384,800 of revenue reserves which stood at that time at £950,000 may not necessarily mean that the dredge transfer programme is being cut down. It could just mean that the Company's big earning power, about to be further enhanced with the ending of tin restrictions, is making past accumulations of funds look over-large. But more light on all this must await the annual statement by the chairman, Mr. J. Ivan Spens, due with the annual report this week-end.

Meanwhile, the company stepped its profit for the year to last March up to £815,967 from £586,458 for 1958-59. The net surplus after tax comes out at £492,967 against £353,458 and there is a fairly full distribution, the 100 per cent dividend absorbing £471,379. The rest goes to the carry-forward which is £21,588 up at £399,986. The dividend is brought up to the 100 per cent (against 85 per cent) with a final of 62½ per cent.

At 27s. 9d. cum the final of 2s. 6d. gross the yield offered on Southern Kinta is as much as 15.2 per cent which on the face of it looks generous especially with the prospects of still better things in the current financial year. The uncertainty in the outlook is not so much the question of financing the dredge transfers, but how much of a dent will be made in earnings while dredges are out of action and whether or not sufficient new ground can, in fact, be found for some of the dredges. So a considerable question mark hangs over the company's life prospects.

KENT TIN TO TRY OPENCAST MINING

Kent (F.M.S.) Tin Dredging has had its dredge on a care and maintenance basis since October, 1958. It has produced its quota from stocks and from arrangements made within the group of mines under Osborne and Chappel management. Now, however, as announced a few weeks ago, it is to restart operations during October following the removal of output restrictions under the International Tin Agreement.

In addition, the chairman, Mr. W. E. Hosking, reveals that the company is to join the new fashion of endeavouring to recover tin economically by opencast methods. At first this is to be done on a limited experimental basis at an estimated cost of £25,000, providing, that is, that permission can be obtained from the Selangor State Government. If all goes well it looks as though this development might eventually be a quite important one in the future of this single-dredge concern. Mr. Hosking says that boring has indicated potentially valuable tin-bearing ground at varying depths and describes the areas as "extensive".

In the meantime, Kent made a profit of £13,303 in 1959 before depreciation against a loss of £11,447 in the preceding year and returned to the dividend list with a payment of 3d. per 1s. share currently quoted at 3s. 9d. to yield 6.7 per cent. Although the dredge is not restarting until relatively late in the current financial year, Kent looks as though it should do rather better in 1960 and possibly increase its distribution.

POOR NEW ISSUE RESPONSES

A pretty fair indication that the recent upsurge in South African gold shares has had little to do with the U.K. investor is the result of two recent new issues. Of the £5,000,000, 7 per cent debenture offer by Gold Fields Mining and Industrial Limited, detailed here last week, only 32 per cent was subscribed, leaving 68 per cent with the underwriters. This was despite the high interest rate and the guarantee of the principal and interest by Consolidated Gold Fields of which G.F.M.I. is a wholly-owned subsidiary.

The other issue was of £1,500,000, 6½ per cent convertible loan stock by Anglo-Transvaal Industries, a member of the Anglo-Transvaal Consolidated Investment group. Of this £3,800 was subscribed in London and £49,780 in Johannesburg leaving the sub-underwriters in the U.K. with £958,490 and those in South Africa with £487,930.

Here is proof indeed of the low investment standing which South Africa currently commands among U.K. investors both private and institutional. In the case of G.F.M.I.,the company itself has its interests almost entirely outside South Africa as explained here last week. The only exception is a holding of West Driefontein. So here it was apparently the fact that the parent company, Gold Fields, is largely connected with South Africa that was enough to check the response. Anglo-Transvaal Industries, on the other hand, is entirely a South African industrial concern.

Politics apart, the intrinsic soundness of both the groups concerned, and of South African mining in general, is not, of course, in question, and it is noteworthy that some big London houses were not averse to taking part in these issues. Mr. H. C. Drayton's

Securities Agency was connected with both. It underwrote the Anglo-Transvaal issue and was joint with J. Henry Schroder & Co. and Helbert, Wagg & Co. in the Gold Fields offer.

In the circumstances it is fortunate that most of the big mining houses are well placed to finance new ventures. A notable recent example was the 6,000,000 share issue at par by Free State Saaiplaas, the developing O.F.S. mine in the Gold Fields group. A consortium of the houses together with South African finance and investment concerns took up the shares. Shareholders as such were given an opportunity to participate if they wished, but it is doubtful whether they did so to any extent. No "result" has been announced beyond the fact that applicants received their allocations in full. Present price of Saaiplaas 10s. shares is 9s. 9d.

TWO CHANCES FOR FREDDIES

A circular to shareholders from Freddies Consolidated, the struggling O.F.S. gold mine in the Johannesburg Consolidated group, indicates that there are now only two hopes left. One is that the western part of the mine might be underlain by economic Elsburg reefs which are being exploited in the adjoining Loraine property. The other is a higher gold price.

The present plan is to eke out the company's resources until mid-1961, by which time it is hoped that the profitability or otherwise of the Elsburg reefs will have been proved. If the answer is unfavourable and there is still no higher gold price then development would have to be stopped and operations would be confined to the extraction of such Basal reef ore reserves as then remained.

The only verdict in these circumstances on Freddies £1 shares, now 1s. 9d., is that they are purely a gamble. If neither hope comes to fruition it will be only a rather long drawn out consolation that the break-up should eventually produce at least 2s. a share.

Anglo American Doubles Interim.—Anglo American Corporation has announced an interim dividend for the current year of 4s. per share compared with an interim of 2s. in respect of 1959. It should not be assumed that this increase necessarily implies any increase in the total distribution for the year, as the Chairman indicated in his annual statement earlier this year that it was his Board's intention to reduce the disparity between the interim and the final dividends. Nevertheless market sentiment has been bullish this week on hopes of a larger total distribution for 1960.

De Beers Interim Unchanged.—The interim dividend on the deferred shares of De Beers Consolidated Mines for the current year to December 31 is to be 5s. (the same as last year). Total dividend distribution in respect of 1959 was 12s. 6d. Assuming that this distribution is repeated, it would give a gross yield of 8.1 per cent at the present price of about 155s.

Doornfontein's Poor Reef Intersection.—Doornfontein Gold Mining Company reports the intersection last week of the Carbon Leader in the No. 1A sub-vertical shaft at a depth of 1,846 ft. below 15 level. Exposure of the reef was complete and sampling of fifteen sections round the periphery of the shaft averaged 8.5 dwts. over 8.6 inches equal to 73 inch-dwts.

Four per cent Interim for Lonrho.—London Rhodesian Mining and Land has declared an interim dividend of 4 per cent (2.4d. per stock unit) for the year to September 30, 1960. Last year's interim payment was 5 per cent, but it will be recalled that this was in respect of a 15-month period from July 1958 to September 1959, due to a change in the financial year end.

Kwahu Maintains Improved Position.—Kwahu Mining Co., a former West African gold producer which has now become an investment holding company, has in the year ended June 30 last, maintained the much improved results achieved in the previous year when the dividend was increased to 30 per cent compared with 15 per cent in 1957-58 and nil in the two preceding years. In the year just ended, the dividend is again 30 per cent. Revenue from dividends and interest at £30,623 and share dealing profits at £25,482, are substantially unchanged from last year, as is the net profit at £47,514. After providing £4,247 for tax and £5,168 written off investments, £15,000 is transferred to reserves (£25,000 last year) leaving a carry forward of £9,430 (£8,101).

Phoenix Prince Capital Reduction.—Phoenix Prince is to make a capital reduction of 1s. per share. An extraordinary meeting will be called in due course to obtain shareholders sanction for the repayment.

Tehidy Minerals Results.—Tehidy Minerals has declared a final dividend of 12½ per cent for the 1959 financial year, making an unchanged total of 17½ per cent. The profit is virtually unchanged at £17,012 before tax.

FEDERAL GOVERNMENT OF NIGERIA

INSPECTOR OF MINES

REQUIRED by the Mines Division, Ministry of Mines and Power, at Jos, Northern Nigeria, for the guidance, control and inspection of mines; enforcement and observance of Safety Regulations, Minerals Ordnance and ancillary legislation. The officer appointed will also be required to maintain official records relating to the mining industry and the preparation of technical reports on mining.

Candidates must possess a recognized degree or diploma in mining engineering, together with two years post-graduate experience. Appointment on contract for one tour of 12-18 months in the first instance, with prospect of extension. Salary according to qualifications and experience in the scale £1.200 to £2.196 per annum (including Inducement Addition) plus gratuity of £100-£150 per annum on satisfactory completion of service. Outfit allowance of £60 on starting salaries under £1,741. Free passages for officer and wife, liberal home leave on full pay, children's allowances while separated, income tax at low local rates, quarters provided at low rent.

Write for application forms and further particulars, stating briefly age, qualifications and experience to Appointments Secretary, Federal Public Service Commission, 9 Northumberland Avenue, London, W.C.2., quoting Q.4/3.

MARKET HIGHLIGHTS

South African Gold shares bounced back into popularity this week. Background to the revival of interest was provided by the increasing demand for gold on the London Bullion Market and heightened interest in the gold price question aroused by the I.M.F. meetings. As usual most of the demand for shares came from Johannesburg and it was believed that the orders were largely on behalf of U.S. investors, but there was also a sprinkling of investment orders from U.K. and Continental buyers.

The revived demand impinged on a market already ill-supplied with stock so that price gains were often out of all proportion to the actual amount of business passing. Equally, dealers were swift to lower prices on Wednesday when Cape demand slackened in front of the approaching Account-end and South Africa's referendum on becoming a republic.

Despite this reaction on Wednesday, share prices still showed good gains over the previous Friday. Western Holdings, for instance, were 6s. 10½d. up at 143s. 1½d. and Free State Geduld at 135s. 7½d. showed an improvement of 4s. 4½d. St. Helena after touching 78s. came back to 77s., a net rise of 1s. Loraine and Doornfontein, however, became distinctly dull at 23s. 3d. and 27s., respectively, following some Cape sales.

In the Finance group, Union Corporation continued their previous advance to 66s. and Anglo American (167s. 6d.) were helped by the increased interim. The new Gold Fields Mining and Industrial debenture, however, opened at a discount of £2. Otherwise, shares of the older mines which would benefit enormously from a higher gold price moved ahead. Durban Deep were outstanding here with a rise of 3s. 7½d. to 29s. 4½d.

Diamonds were also firm with De Beers in restricted supply at around 156s. 3d. Platinums were given a fillip by the higher than expected final dividends and Potgietersrust rose 1s. to 10s.

The base metal share markets were overshadowed by the interest in Golds, but there was still a reasonable business passing in selected shares. Coppers, for instance, had a weakening Wall Street to contend with, yet there was little easing in share prices. Bancroft came to life with a jump of 1s. 1½d. to 18s. 9d.; the move followed an announcement of a board meeting on October 6 and this was taken to foreshadow the declaration of a maiden dividend, estimates of this ranging up to 2s. a share. Despite their big holding in Bancroft, Rhokana varied little at around 50s.

Tins attracted few buyers and in idle conditions share prices were inclined to droop. Ayer Hitam drifted down from 25s. 6d. to 23s. 6d. and Sungei Besi were also dull at 25s. Southern Kinta, however, strengthened to 28s. following the higher dividend and profits and the unexpected proposal for a 2s. return of capital.

In the Australian sections, Golds became firmer in the wake of Kaffirs. Lake View and Star improved 1s. to 26s. 6d. and Gold Mines of Kalgoorlie became a firmer market at 9s. 6d. The Lead-zincs continued to move rather uncertainly, but New Broken Hill rose 1s. to 48s. 9d. Consolidated Zinc brightened to 71s. 9d. after the previous week's setback to 70s. 6d. that had followed news of the dissolution of the partnership with British Aluminium in the Australian bauxite project.

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U.S. Granite Air Hose in a mine in North Portugal

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This feature appears every fourth week

Personal

Mr. J. G. Mighell, sales manager of Mandoval, which is under the management of the Rio Tinto mining group, has returned to the U.K. after an extensive sales and development tour of Mediterannean and Middle East countries.

★

The Institution of Mining and Metallurgy has announced that Mr. A. R. O. Williams is to be President-elect for the year 1961-1962.

★

Mr. D. A. F. Donald, chairman and managing director of National Cash Register Co., has been appointed chairman of G. A. Harvey and Co. (London). Sir Thomas Overy has resigned the chairmanship on health reasons, but remains a director of the company.

★

Mr. Alfred Ratcliffe has been appointed a director of Metals Division, Imperial Chemical Industries Ltd. For the past nine years Mr. Ratcliffe has been production director, and latterly also engineering director, of I.C.I. Salt Division.

★

Frank L. Magee, president of Alca since 1957, has been named chairman of the board; Lawrence Litchefield, Jr., was elected president after serving as an executive vice-president; and I. W. Wilson, board chairman for three years, was elected chairman of the newly-formed finance committee.

Lieutenant-General Sir Henry Wells has joined the Board of Directors of Broken Hill South Limited.

★

Goodyear Tyre and Rubber Co. (Great Britain) announce the appointment of Mr. J. L. Mumby as financial director and secretary in succession to Mr. W. R. Booth, who has returned to the U.S. as an assistant treasurer of the parent Goodyear Tire and Rubber Co. in Akron, Ohio, and treasurer of the subsidiary Goodyear International Corporation.

★

Bray Construction Equipment announce the appointment of Mr. W. Muir as London Manager.

★

Mr. W. A. Ankerson has joined the board of Associated Electrical Industries (Woolwich) as assistant managing director.

★

British Caterpillar Co. announce that Mr. G. P. Robertson has been appointed assistant manager, sales department, and will assist Mr. E. W. Doubet, sales manager in the administration of sales activities of the company.

★

Mr. Richard Miles, who retired recently as chairman of Head-Wrightson & Co. Ltd., has been appointed a director and chairman of Joy-Sullivan Ltd.

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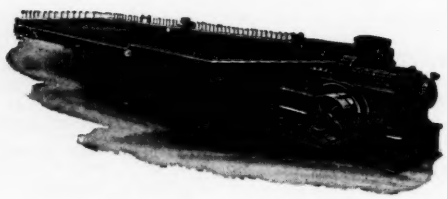

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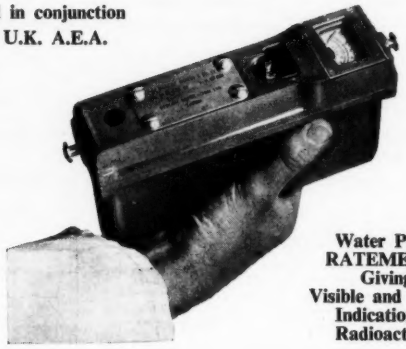

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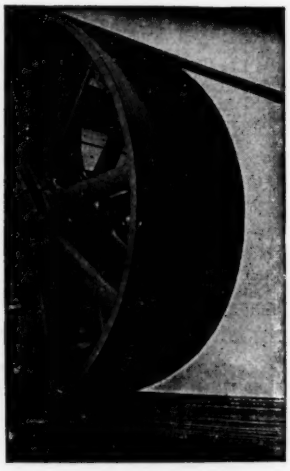

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